

MEDICINAL AND COSMETIC PRODUCTS USED IN TREATMENT OF HAIR LOSS

Natalia Abramek¹⁾, Magdalena Naja-Wiśniewska²⁾, Barbara Nieradko-Iwanicka¹⁾

¹⁾ Hygiene and Epidemiology Department, Medical University of Lublin, Poland

²⁾ Department of Geriatrics, Stefan Cardinal Wyszyński Provincial Specialist Hospital in Lublin, Poland

³⁾ Hygiene and Epidemiology Department, Medical University of Lublin, Poland

ABSTRACT

Hair loss or alopecia is a reduction in the volume or complete loss of hair and is a fairly common clinical problem, especially in the geriatric population. Androgenetic alopecia (AGA) is the most common type of hair loss in men. Androgenetic alopecia in women most often occurs before the age of 60. We also distinguish androgenetic alopecia in postmenopausal women and scarring, areata, telogen and drug-induced alopecia. The aim of the study was to analyze the composition of medicinal and cosmetic preparations available on the Polish market, recommended for people struggling with alopecia. In 2022, the composition of preparations used in alopecia available in pharmacies and drugstores was analyzed.

In total 57 medicinal and cosmetic preparations recommended for people suffering from alopecia have been identified. The most common active substance in the analyzed preparations is finasteride. Frequently used active substances are biotin and minoxidil, rarely prednisolone.

Conclusions:

1. In preparations intended for people with alopecia, the most frequently used active substance is finasteride.

2. Statistically, preparations for hair loss are most often in the form of tablets and shampoos.

3. The analyzed preparations for alopecia belong to the category of prescription drugs and cosmetics, less often in the category of OTC drugs or dietary supplements.

Keywords: hair loss, medicines, cosmetics

ARTICLE INFO

PolHypRes 2022 Vol. 80 Issue 3 pp. 73 – 88

ISSN: 1734-7009 **eISSN:** 2084-0535

DOI: 10.2478/phr-2022-0018

Pages: 16, figures: 0, tables: 1

page www of the periodical: www.phr.net.pl

Review article

Submission date: 11.06.2022 r.

Acceptance for print: 14.07.2022 r.

Publisher

Polish Hyperbaric Medicine and Technology Society



INTRODUCTION

Hair loss or alopecia is a reduction in the volume or complete loss of hair [1] and is a fairly common clinical problem, especially in the geriatric population [2]. Hair is an essential element of appearance and is especially important for women [3]. Alopecia has a very significant impact on human life, it can lead to limitations in various aspects, it can affect the human psyche. This is not only an aesthetic problem [3].

Alopecia can be a symptom of various diseases or may appear as a result of:

- disorders of the function of the hair follicles, which in turn results in increased loss of terminal hair,
- miniaturization of hair follicles,
- damage to the hair follicles [1].

Miniaturization of the hair follicle is one of the symptoms of androgenetic alopecia occurring in both women and men. It is a process in which the diameter of the hair follicle is reduced, and consequently the terminal hair turns into vellus.

There are 3 types of alopecia mechanism in the context of changes within the hair follicle. The first is to reduce the number of mitoses in cells in a sudden and significant way. This results in the atrophy of the bulb and a reduction in the thickness of the hair root, which in turn causes it to break off in the area of a significant narrowing and fall out. This is a mechanism that causes androgenetic alopecia, and hair loss can be observed even a few days after the appearance of a harmful factor. The second type of mechanism is based on too early atrophy of the hair follicle, which leads to too rapid transition to the telogen phase. This is an example of the mechanism seen in telogen effluvium where there is an initial latency period (usually 2-4 months) after which the hair falls out. The last, third type of mechanism is based on the simultaneous occurrence of mechanism 1 and 2 and is an example of a mechanism in mixed alopecia [4].

Not every excessive hair loss will lead to baldness, and increased hair loss is most often a temporary and reversible condition. It can be the result of a previous illness, stress, it can be a consequence of smoking cigarettes and even an inadequate diet or medication. Too little protein intake or too much caloric deficit can cause delayed hair growth or reduce the thickness of the hair shaft [4]. A diet low in iron, folic acid, zinc and amino acids will also have a negative effect on hair and may contribute to increased hair loss [5]. Vitamin A is very important for proper hair growth. Its excessive consumption and a diet rich in beta-carotene can lead to baldness. This excess is most common in people living in the Arctic, eating a lot of fish, whale liver and white bear fat. It will be similar in people who are treated with retinoids [4].

Iron is also very important in ensuring good hair health. Iron is part of hemoglobin and thus participates in ensuring the proper structure of erythrocytes [6].

Many systemic diseases can lead to excessive hair loss: lupus erythematosus; lichen planus; seborrheic dermatitis; rheumatoid arthritis; psoriasis; Hashimoto's disease; syphilis; mental disorders; infectious diseases or hypothyroidism and hyperthyroidism [4]. Infectious diseases with high fever (measles, tuberculosis, typhoid) can lead to the appearance of telogen effluvium. Hair then

falls out in a sudden and profuse way, but after the infectious disease is cured, everything returns to normal. Lupus erythematosus is an autoimmune disease that affects many organs. Quite a specific symptom is facial erythema in the shape of a butterfly, joint pain and also increased hair loss affecting not only the scalp, but also eyebrows and eyelashes.

There is both non-scarring and scarring alopecia. Lichen planus (LPP) is a chronic disease of mucous membranes and skin. It is manifested by itching and the appearance of papular lesions. Lichen planus folliculitis causes inflammation near the hair follicles, which in turn results in alopecia. Initially, it is small, the inflammatory foci merge with each other, occupying more and more areas of the scalp. LPP is more common in women and people with fair skin, it can lead to scarring alopecia. Seborrheic dermatitis is a disease characterized by inflammation of the skin. The characteristic symptoms are redness, itching and flaking of the skin, which can lead to damage to the hair follicles and increased hair loss. Psoriasis is a chronic disease in which the life cycle of the cell is shortened from 28 days to 3-4 days, so that old cells cannot keep up with exfoliation. As a consequence of this process, a thick layer of dead cells appears on the body, resembling scales. Flaky inflammatory foci on the scalp can lead to damage to the hair follicles and increased hair loss. Chronic thyroiditis, also known as Hashimoto's disease, can manifest as autoimmune cells attacking the hair follicles. What's more, the reduced concentration of thyroxine in the blood can also contribute to excessive hair loss [5].

In addition, in hyperthyroidism, baldness can be observed up to the frontal part of the head, and the hair itself becomes thin. On the other hand, with hypothyroidism, the hair becomes dry and brittle. In the case of diabetes, excessive hair loss occurs until the appearance of baldness on the top of the head [4]. As a result of excessive blood sugar levels, microcirculation in the body is disturbed, as a result of which the hair follicles are insufficiently nourished. This contributes to the inhibition of hair growth and excessive hair loss. Taking various medications can also contribute to increased hair loss. Treatment with methotrexate, immunosuppressants, heparin, propranolol, fibrates, carbamazepine, antithyroid drugs (thiamazole or thiouracil), and even taking levodopa, retinol or tricyclic antidepressants (TCAs) can cause excessive hair loss. Poisoning with heavy metals such as talc, arsenic or mercury can lead to baldness. In addition, mechanical factors such as hair pulling, combing in a ponytail, excessive hairdressing treatments such as dyeing, bleaching or perms will have a negative impact on the hair and may cause increased hair loss [5].

Androgenetic alopecia (AGA) is the most common type of baldness in men, and hair loss is gradual [7]. AGA occurs in about 80% of men with baldness [8]. Miniaturization of the hair follicles is observed, which is associated with a reduction in the duration of the anagen phase [9]. This process may most likely have a genetic basis [8]. The shortening of the hair growth phase may be related to the increased activation of the androgen receptor. In patients with this type of alopecia, excessive activity of 5-alpha-reductase and increased activation of dihydrotestosterone are also observed. Testosterone is converted by 5-alpha-reductase to dihydrotestosterone (DHT) and can cause increased hematocrit levels,

increase in muscle mass and is also responsible for stimulating growth during puberty. Bitemporal thinning of hair on the scalp is a textbook symptom of androgenic alopecia in men. These changes mainly involve the apical and frontotemporal spaces. The appearance of yellow dots and black dots is also observed. Yellow dots are sebum or keratin-filled follicle openings and may also occur in alopecia areata and in the course of the cutaneous form of lupus erythematosus [7]. Androgenetic alopecia in men can start as early as puberty and then stop [8]. To assess the severity of androgenetic alopecia, we use the scale of severity - the Hamilton and Norwood scale [9]. This scale is based on 7 stages of baldness, with stage 1 showing no significant hair loss, stage 4 showing the first characteristic signs of early form of baldness, and the hairline receding at both temples and resembling a V, U be M; and in stage 7 - the hairline is located in the occipital part of the head and the rest of the scalp is hairless [5]. However, the presented scale does not allow for the assessment of disease activity, as the individualization of the course of the disease in patients is observed. This fact makes it impossible to determine the prognosis of the treatment [9]. Many studies indicate a link between androgenetic alopecia and an increased risk of cardiovascular diseases. In addition, people with androgenetic alopecia are more likely to develop atherosclerosis, hypertension, and even insulin resistance (IO) and obesity [10].

Tablets containing 5-alpha-reductase inhibitors - finasteride and dutasteride are used orally, and minoxidil and finasteride are used topically. Natural extracts of saw palmetto, licorice, green tea and even rosemary are also used in the treatment of AGA in men [7].

Androgenetic alopecia in women is most often caused by androgens [7]. It occurs in about 60% of affected women before the age of 60 [8]. The first symptoms of hair reduction can be observed between 12-40 years of age. As in men, women also have excessive androgen receptor activity and increased 5-alpha-reductase activity. Shortened hair growth cycles and increasing miniaturization of hair follicles have been demonstrated. Androgenetic alopecia in women is progressive, however, it will not lead to complete baldness. This type of alopecia is quite common in women suffering from PCOS, hyperandrogenism, endocrine disorders, obesity, diabetes, or who have been diagnosed with adrenal or ovarian tumors [7]. Environmental factors that can provoke the appearance of this type of baldness in women are detergents present in shampoos, varnishes and hair dyes. Stress is also of great importance in etiopathogenesis [5].

Diffuse alopecia is a fairly common form of androgenetic alopecia in women. It consists in reducing the number of hairs in the parietal-apical part of the scalp [8]. In addition, women with AGA have perifollicular hyperpigmentation, "yellow dots" and exclamation mark hair. If a woman has a dark skin phenotype, so-called "white dots" are possible. The yellow dots seen in the trichoscopic image are actually empty hair follicles. Mild perifollicular inflammation can be demonstrated by biopsy if indicated. Tests should be performed to determine blood levels of androgens, 7-OH-P, prolactin, DHEA, TSH, triiodothyronine (FT3), tetraiodothyronine (FT4), FSH. The tests should be performed when the patient is in the follicular phase of the menstrual cycle. To assess the severity of androgenetic alopecia in women, visual scales are used: the Ludwig scale, the Sinclair scale,

and the Savin scale. The Ludwig scale distinguishes three stages of alopecia, where in stage 1 there is a reduction in the number of hair in the front part of the head, and in stage 3 there is complete hair loss in this area. The Sinclair scale, on the other hand, distinguishes five degrees of severity: in degree 1, there is no reduction in the number of hairs on the scalp; in the 3rd degree, a large reduction in the number of hairs on the middle part of the scalp is visible; in the 5th degree, we already observe significant hair loss. The next scale is the Savin scale, in which nine grades are distinguished, including advanced baldness, frontal baldness. Minoxidil with a concentration of 1% and 5% is used in local treatment, it can also be used orally. Other drugs used in the treatment of androgenetic alopecia in women include dutasteride, cyproterone acetate, spironolactone and flutamide [7].

Coronal alopecia is quite common during menopause. It appears in women over 50 years of age. Before menopause, the level of estrogen in the blood decreases and the level of androgens increases. During menopause, the concentration of estradiol decreases, however, hormone replacement therapy (HRT) can be used and a synthetic form of estradiol can be administered. Estradiol has a significant impact on the growth cycle of the hair follicle [7]. A decrease in its concentration makes the hair follicles more susceptible to testosterone, which reduces the duration of the hair growth phase. The pathomechanism of this type of alopecia is similar to that observed in androgenetic alopecia in women and men. During menopause, in addition to alopecia of the scalp, hirsutism can be observed on the face.

In order to carry out appropriate diagnostics, it is necessary to perform serum ferritin, free and total testosterone, prolactin, DHEAS levels, determine the erythrocyte sedimentation rate (ESR) and order a complete blood count [7]. This type of alopecia can lead to the destruction of hair follicles and scarring, resulting in hair loss [8]. We can distinguish primary scarring alopecia, where the hair follicles are irreversibly damaged, and fibrous tissue grows in their place due to inflammation. The cause of the secondary form is related to burns or infections, not to the hair follicles. In addition, there are 3 types of primary cicatricial alopecia: lymphocytic, neutrophilic and mixed. Hereditary folliculitis is a neutrophilic form of alopecia. It is manifested by scarring, papules and even cellulitis on the scalp. On the other hand, lichen planus, lupus erythematosus and pseudoplaque alopecia belong to the lymphocytic form. The mixed form includes necrotizing folliculitis, pustular dermatosis and acne keloidis [7].

Scarring alopecia is an irreversible form, because the factors causing fibrosis within the hair follicles probably also cause damage to the structure of the bud, which prevents the reconstruction of the follicles. Many diseases can lead to the appearance of hairless lesions, e.g. in the case of cancer, syphilis, skin infections, herpes zoster, lupus erythematosus [9]. In the course of this type of baldness, we observe the formation of scarring foci without hair on the scalp. Most often, this alopecia does not cover the entire scalp, only the foci [5]. To make a correct diagnosis, a trichogram and trichoscopy should be performed. It may also be helpful to do a pull test where about 20 hairs are pulled. If more than 10 hairs fall out, the result is considered positive. It is also worth assessing the degree of damage to the

follicles under a microscope. The treatment of scarring alopecia is mainly based on reducing hair loss and limiting the appearance of this type of alopecia. In addition, glucocorticosteroids [7], antimalarial drugs or long-term antibiotic therapy may be used. Surgical procedures are used already at advanced stages of the disease [11].

Alopecia areata (AA) is one type of non-scarring alopecia. Although it is inflammatory, its pathogenesis is not fully understood. This type of alopecia is diagnosed in even 0.7-3.85% of patients who see a dermatologist, and in the general population it is diagnosed in about 1-2%. Environmental as well as genetic factors will greatly influence the development of alopecia areata. Moreover, it has been shown that AA may occur as a result of autoimmune processes [6]. This is indicated by the fact that antithyroid antibodies are often present together with alopecia areata. Moreover, in some cases, this type of alopecia can be associated with the nervous system, and even with a familial occurrence [12]. The scalp microbiome and vascular changes will also play an important role. Even high stress, diseases with high fever can be triggering factors [7]. In patients suffering from alopecia areata, diseases such as vitiligo, pernicious anemia, and systemic lupus erythematosus quite often coexist with alopecia [2]. An important issue in the pathogenesis of alopecia areata is damage to hair follicles by T lymphocytes [6]. Stimulated lymphocytes release cytokines that damage hair follicles [8].

Exclamation mark hairs are a very important feature taken into account in the diagnosis. These are very short hairs, the diameter of which grows from the scalp [7]. Abrupt hair loss on the scalp, resembling several patches without scarring, is a very characteristic symptom. However, this process is reversible and up to 60% of patients experience hair regrowth within a year [8]. The hair that then grows back is thinner and initially contains no dye. However, after some time their appearance returns to normal [7]. There is currently no approved effective treatment for alopecia areata. Patients can be given anti-inflammatory and immunosuppressive drugs (GCS, cyclosporine A), cygnoline or minoxidil. [2]. This alopecia has a diffuse form, without the presence of scars. It is characterized by hair loss in the telogen phase. The incidence of telogen effluvium in children is about 3%. It is caused by disorders of the hair growth cycle. It can be caused by various factors, such as stress, autoimmune diseases, psoriasis, vitamin D and iron deficiency, or it can be caused by the use of medications such as retinoids, antidepressants, hormonal contraception [7].

Hair thinning is observed all over the scalp. It takes about 3-4 months from the action of the trigger to hair loss and this is the so-called latency period. Most often, hair falls out for several months and stops falling out spontaneously when the action of the triggering factor is inhibited. Treatment usually consists in identifying and eliminating the triggering factor [8]. This type of baldness is a side effect of medications. Reversible hair loss is caused by the toxic effects of drugs on the hair follicle matrix. Drugs that can cause drug-induced alopecia include: retinoids, anticonvulsants, antithyroid drugs, heparin, non-steroidal anti-inflammatory drugs, antidepressants or contraceptives, and even cytostatics. After stopping the medication, baldness should go away on its own, and the hair usually grows back noticeably after 3-6 months [7].

Żychowska et al. conducted a study on a 63-year-old woman treated with erlotinib. It is a drug from the epidermal growth factor receptor inhibitor (EGFRI) group, used in the treatment of adenocarcinoma of the left lung. As a result of these studies, it was found that the use of drugs from the EGFRI group may lead to the development of extensive scarring alopecia as a side effect of therapy [13].

Latuszek and Brzezińska-Wcisło conducted a study evaluating the effect of cyclophosphamide and fluconazole on the course of hair cycles. They found that in the group of rats receiving cyclophosphamide, an excessive percentage of hair in the telogen phase and dystrophic hair can be observed, while in the group of rats receiving fluconazole, accelerated catagen involution and an excessive percentage of hair in the telogen phase can be observed. The results of the study confirmed that both drugs can cause drug-induced alopecia [14].

Some drugs, such as minoxidil or diazoxide, may cause an unintended effect - they will cause the appearance of excessive hair [7].

Trichotillomania is a type of alopecia caused by the patient himself [11] and is related to anxiety disorders. It consists in consciously pulling hair out of the scalp and even eyebrows. Hair regrowth depends on the degree of damage to the hair follicles. If they have not been damaged, the hair will grow back spontaneously, and if the follicles are damaged, regrowth is impossible [7]. Trichotillomania is more often observed in women, regardless of age [11]. Treatment should be carried out under the supervision of a dermatologist, trichologist and psychiatrist. Special therapy should be used to break the habit of pulling hair out [7].

OBJECTIVE

The aim of the study was to analyze the composition of medicinal and cosmetic preparations available on the Polish market, recommended for people struggling with alopecia.

METHOD

In 2022, the composition of preparations used in alopecia available in Polish pharmacies and drugstores (Hebe and Rossman) was analyzed.

RESULTS

In total 57 medicinal and cosmetic preparations recommended for people suffering from alopecia have been identified. They are summarized in the table (Tab. 1).

Medicinal and cosmetic preparations available in Poland for people with alopecia (prescription-over the counter-OTC preparation; prescription drug-RP).				
No	Name	Category	Active substance	Manufacturer
1	Alopexy 50 mg/ml	OTC	Minoxidil	Pierre Fabre
2	Minovivax 2%	OTC	Minoxidil	Axxon
3	Alocutan 20 mg/ ml	OTC	Minoxidil	Sun-Farm
4	Vichy Dercos Aminexil Clinical 5, hair loss treatment for women	Dermo - kosmetic	Minoxidil	L'Oréal Paris
5	Alocutan Forte 50 mg/ ml	OTC	Minoxidil	Sun-Farm
6	Loxon 2%	OTC	Minoxidil	Perrigo
7	Hairgen Spray	Medical device	Melatonin	Boderm Laboratories
8	DX2LEK	OTC	Minoxidil	Aflofarm
9	Vichy Dercos Aminexil Clinical 5, hair loss treatment for men	Dermo - kosmetic	-	L'Oréal Paris
10	Piloxidil 20 mg/ ml	OTC	Minoxidil	Aflofarm
11	Seboradin Men Ampułki Forte	Cosmetic product	-	EDYTA PAWLUŚKIE WICZ LARA SP. Z O.O.
12	Hairvity MEN	Dietary supplement	Biotin	GARDENPHARM SP. Z O.O.
13	Kerabione Mama	Dietary supplement	Biotin	VALENTIS POLSKA SP. Z O.O.
14	Kerabione Booster	Dietary supplement	-	VALENTIS POLSKA SP. Z O.O.
15	WAX ang Pilomax TRICHO Maska	Cosmetic product	-	PILOMAX SP. Z O.O.
16	PHARMACERIS H-Stimuforten, Intensive hair growth stimulating treatment	Dermo - kosmetic	-	LAB.KOSM. DR IRENA ERIS
17	Loxon Max 5%	OTC	Minoxidil	SANOFI AVENTIS SP. Z.
18	DERMEDIC CAPILARTE, Hair growth therapy	Dermo - kosmetic	-	BIOGENED S.A.
19	DERMEDIC CAPILARTE Hair strengthening and hair loss prevention treatment	Dermo - kosmetic	-	BIOGENED S.A.
20	Ziaja Med Strengthening Treatment, anti-hair loss shampoo	Cosmetic product	-	ZIAJA LTD. Z.P.L. SP. Z O.O.
21	BIOTEBAL Men Biotin Anti-Hair Loss Shampoo	Cosmetic product	Biotin	ZAKŁADY FARMACEUTYCZNE POLPHARMA S.A.
22	DX2, shampoo for men against hair loss	Cosmetic product	-	AFLOFARM FARMACJA POLSKA SP. Z O.O.
23	Novoxidyl, anti-hair loss tonic	Cosmetic product	-	POLFARMEX S.A.
24	Novoxidyl, anti-hair loss shampoo	Cosmetic product	-	POLFARMEX



				S.A.
25	Seboradin Forte Anti-Hair Loss Shampoo	Cosmetic product	-	EDYTA PAWLUŚKIE WICZ LARA SP. Z O.O.
26	BiovaxMed, dermo-stimulating shampoo for hair regrowth	Dermo - kosmetic	-	L'BIOTICA
27	KeratinCell	Dietary supplement	D-biotin	BIO MEDICAL PHARMA SP. Z O.O.
28	Kerabione Booster Oils, strengthening hair serum for hair prone to falling out	Cosmetic product	-	VALENTIS POLSKA SP. Z O.O.
29	VICHY DERCOS Szampon wzmacniający	Dermo - kosmetic	-	L'OREAL
30	Finaster 5mg	RP	Finasteride	LEK-AM
31	Alpicort E	RP	Prednisolone	Dr. August Wolff
32	Radical Med, hair loss treatment for women	Dermo - kosmetic	Biotin	Instytut dermokosmetyków Ideepharm Sp. z o.o.
33	Dermena Hair Care, anti-hair loss shampoo	Dermo - kosmetic	-	Pharmena
34	Finapil 1 mg	RP	Finasteride	SUN-FARM
35	Propecia 1 mg	RP	Finasteride	ORGANON
36	Apo-Fina, 5 mg	RP	Finasteride	Aurovitas Pharma Polska Sp.z o.o.
37	Hyplafin 5 mg	RP	Finasteride	+PHARMA ARZNEIMITT EL GMBH
38	Penester 5 mg	RP	Finasteride	ZENTIVA
39	Proscar 5mg	RP	Finasteride	MSD
40	Adaster 5mg	RP	Finasteride	Adamed Pharma S.A.
41	Finxta 5mg	RP	Finasteride	FARMA PROJEKT
42	Zasterid 5mg	RP	Finasteride	RICHTER GEDEON
43	Nezyr 1mg	RP	Finasteride	AXXON
44	Symasteride 5 mg	RP	Finasteride	SYMPHAR
45	Finamef 5 mg	RP	Finasteride	TEVA PHARMACEUTICALS POLSKA
46	Finaran 5 mg	RP	Finasteride	RANBAXY
47	Finasterid Stada 5 mg	RP	Finasteride	STADA
48	Antiprost 5mg	RP	Finasteride	ORION CORPORATION/ORION OYJ
49	Finasteridum Bluefish 5 mg	RP	Finasteride	Bluefish Pharmaceuticals AB.
50	Androster 5 mg	RP	Finasteride	ACTAVIS GROUP PTC EHF
51	Uronezyr 5 mg	RP	Finasteride	AXXON
52	Androstatin 1 mg	RP	Finasteride	LEK-AM
53	Biotebal 5 mg	OTC	Biotin	POLFA WARSZAWA
54	Biotylek Max 10 mg	OTC	Biotin	HASCO-LEK
55	Biotynox Forte 10 mg	OTC	Biotin	Biofarm
56	Doppelherz Aktiv Na włosy i skórę	Dietary supplement	D-biotin	QUEISSER
57	Finpros 5 mg	RP	Finasteride	KRKA

Among the analyzed preparations, the most products were in the category of prescription drugs, as much as 38.6%. Another category of products used in hair loss were cosmetics (31.58% of all collected preparations). The fewest products found were in the category of dietary supplements - 8.77% and medical devices - 1.75%.

The most common form of the preparation for hair loss among the analyzed ones are tablets. Less than half of all preparations - 45.61% were in the form of tablets. Another quite frequent form is shampoo - 17.54% and skin lotion - 10.53%. The fewest analyzed products are in the form of a mask and a spray for the skin - 1.75% each.

The most common active substance in the analyzed preparations is finasteride. It is found in 53.85% of preparations containing the active substance, which is more than half of the analyzed preparations. Other frequently occurring active substances are biotin and minoxidil. Biotin is found in 23.08% of the analyzed preparations containing active substances. Minoxidil was found in 20.51% of products containing active substances in their composition. The least common active substance in the analyzed preparations is prednisolone (in one preparation).

DISCUSSION

Excessive hair loss has a negative impact on the patient's life, especially his mood. It reduces the quality of life. Many people suffering from baldness struggle with a sense of shame, which can even lead to depressive disorders. Furmańska decided to focus on the sense of shame in her research. Together with other researchers, they conducted a study on 314 patients. They were asked to rate their level of shame on a scale of 1-10 for 10 diseases. The subjects stated that the shame caused by androgenetic alopecia prevents them from being spontaneous to a large extent. The results of the study indicate the need for psychological assessment of people struggling with alopecia [15].

Minoxidil is a frequently used active ingredient for patients with alopecia. It is found in the preparations Minovivax 2%, Loxon 2%. It locally stimulates blood flow through the vascular bed, it has no antiandrogenic effect. It causes an increase in the number of vellus hairs. It is used in both women and men. It may cause side effects such as facial hypertrichosis and scalp irritation [16]. A study was conducted where patients used 3% minoxidil twice a day. As a result of this therapy, 63.6% of the examined patients observed at least a partial response, and 27.3% fully responded to the therapy [17]. An experiment was also conducted comparing the effects of topical minoxidil 3% with a combination of minoxidil 3% + finasteride 0.1% in people with AGA for 24 weeks. Greater hair growth was found in combination therapy than in monotherapy with minoxidil [18]. There have been 2 randomized, double-blind, parallel studies of 5% minoxidil foam in the treatment of female pattern hair loss. In one, patients used 5% minoxidil foam or carrier foam for 24 weeks. In the second, patients used 5% minoxidil foam once a day or 2% minoxidil solution twice a day for 52 weeks. These studies confirmed the effectiveness of minoxidil in the treatment of female

pattern hair loss. Studies have also shown that hair growth using a 5% minoxidil solution once a day is

similar to using a 2% minoxidil solution twice a day. At the same time, it was found that a 5% solution used once a day gives less side effects and a lower risk of non-compliance with therapeutic recommendations [19]. As many as 8 studies collected in the review conducted by van Zuuren confirmed a significant increase in the number of hairs per cm² in the minoxidil group compared to the placebo group [20].

Steroids in the treatment of alopecia can be administered intralesionally or locally. Intralesional administration is considered the primary therapy in the treatment of AA. The most commonly used substance is triamcinol acetonide with a concentration of 2.5 mg/ml to even 10 mg/ml. Topical steroid application is less effective than focal application. However, some physicians prescribe topical steroids under occlusion to their patients. An ointment with 0.05% clobetasol propionate under occlusion has been shown to improve hair regrowth in 8 out of 28 patients suffering from alopecia.

However, only 5 people had full hair growth after a year of therapy [17]. Among the preparations tested in this study, prednisolone in the form of a liquid for the skin was found in Alpicort E. Moreover, in 2005, a study was conducted in which patients were subjected to 3 months of oral prednisone therapy at a dose of 200 mg weekly. As a result, hair regrowth was noticed in 60% of the examined patients. However, the general administration of steroids does not give lasting effects and may cause side effects such as hyperglycemia, cataracts, post-steroid acne [6].

Caffeine may also be a promising substance in the treatment of baldness. It is the most commonly consumed substance with psychoactive properties and stimulating the central nervous system. Through various reactions, it leads to the stimulation of metabolism and cell proliferation. It has especially beneficial potential in people suffering from excessive hair loss, which can be the result of premature termination of the hair cycle.

As a result of many studies, even clinical *in vivo*, it was found that caffeine is effective in the treatment of hair loss in topical therapy cosmetics. Caffeine affects the hair follicles, lengthens the hair shaft, and affects factors that regulate hair growth in a dose- and sex-dependent manner. In *in vivo* studies in both women and men with AGA, caffeine in topical therapy reduced hair loss. In addition, a topical caffeine-containing lotion has been proven to be as effective as minoxidil in men with AGA [21].

Patients struggling with hair loss quite often ask if dietary supplements will help them fight baldness. It is nutritional deficiencies that can also contribute to the occurrence of excessive hair loss. However, if these deficiencies do not occur, supplementation may not only not bring improvement, but also harm the hair. The relationship of excessive supplementation of e.g. selenium, vitamin A or vitamin E with increased hair loss has been confirmed. Dietary supplements are advertised everywhere and promote the use of hair loss products that are readily available to patients. However, you should be very careful with them so as not to lead to toxicity with excessive supplementation. Our list includes as many as 9 preparations for baldness containing biotin. Biotin, otherwise known as vitamin H, is a cofactor for

carboxylation of enzymes. Its deficiency can cause a rash or alopecia. A study was conducted where an infant was given biotin-free formula milk. As a result, it was observed alopecia, however, this symptom disappeared after the introduction of biotin supplementation. Due to the fact that intestinal bacteria produce biotin, its deficiency is quite rare. A patient may develop a biotin deficiency if they take anti-epileptic drugs, antibiotics that disrupt the flora of the digestive tract, or if they consume too much raw egg white. However, no studies have confirmed the effectiveness of biotin supplementation in the absence of deficiency in the treatment of alopecia [22].

L-cysteine (L-Cys) is part of the building blocks necessary for protein synthesis. In addition, it contains sulfur in the form of a thiol group (-SH). It is a fairly large part of keratin, which is one of the most common proteins in the skin and hair. L-Cys forms disulfide bridges that provide strength and rigidity to the keratin. Due to these facts, mixtures fortified with L-Cys can help repair hair damage and reduce hair loss in patients struggling with alopecia [23].

Abbas conducted a study in which he wanted to see if ginger could improve the oxidative state in patients with alopecia areata. It is believed that oxidative and emotional stress as well as infections may be related to the appearance of alopecia areata. The ginger powder used in this study also contained many anti-inflammatory and immunomodulatory ingredients. Abbas confirmed that zinc and copper levels were different in AA patients compared to controls. He stated that taking ginger powder as a supplement can improve the oxidative-antioxidant balance of erythrocytes and lymphocytes and has an impact on the renewal of the appropriate level of zinc in the serum in people suffering from AA [24].

Vitamin D is an important regulator of the immune response. Therefore, its role in the autoimmune processes occurring in the course of AA, where antibodies against hair follicles are present, has been considered. Many studies have confirmed the relationship between vitamin D deficiency and the development of AA. Currently, vitamin D supplementation in the treatment of AA seems to be a promising supplement to the conducted therapeutic therapy, however, it is still necessary to conduct many studies in this direction [25].

Low Level Laser Therapy (LLLT) was discovered in the 1960s. It was then noticed that mice irradiated with a red laser grew hair. LLLT can improve both AA, AGA and chemotherapy-induced alopecia. In addition, some studies have suggested that LLLT may also be used after hair transplant surgery to aid wound healing. It is also suspected that LLLT may reduce the inflammation that occurs in the course of AA. Most of the studies conducted

used wavelengths in the range of 635 – 650 nm. In the future, research should be conducted using longer wavelengths, e.g. 810 nm [19].

Other methods of therapy can also be used in the treatment of baldness. One of them is stem cell treatment. We distinguish E1 stem cell therapy, during which hair is cloned by injecting stem cells of hair follicles multiplied by the in vitro method, which cause the growth of new follicles, and E2 therapy. In the E2 therapy, the stem cells used in the treatment come from adipose tissue. Preliminary results of the study determined that both E1 and E2 therapy may be effective in the treatment of AGA. However, further research is needed to confirm the safety and efficacy of both treatments. Another possible therapy for the treatment of AA may be a combination therapy of simvastatin and ezetimibe. Treatments have been conducted where 14 out of 19 patients with extensive AA responded to the therapy. The combination of both drugs can be an effective additional method that could increase the body's response to other therapies [26].

CONCLUSIONS

1. In preparations intended for people with alopecia, the most frequently used active substance is finasteride.
2. Statistically, baldness preparations are most often in the form of tablets and shampoos.
3. The analyzed preparations for alopecia belong to the category of prescription drugs and cosmetics, less often in the category of OTC drugs or dietary supplements.

REFERENCES

1. Rudnicka L, Kaczorowska A. Treatment of diseases associated with non-cicatricial alopecia. *Dermatology Review/Przegląd Dermatologiczny*. 2021;108(6):504-516. doi:10.5114/dr.2021.114603.
2. Noszczyk M, Kosmetologia pielęgnacyjna i lekarska, Warszawa: Wydawnictwo Lekarskie PZWL; 2011.
3. Imko-Walczuk B, Cegielska A, Gliombiowska M. Changes in hair distribution in postmenopausal women. *Dermatology Review/Przegląd Dermatologiczny*. 2012;99(1):62-67.
4. Przyłipiak A, Medycyna estetyczna: podręcznik dla studentów kosmetologii, Warszawa: Wydawnictwo Lekarskie PZWL; 2020.
5. Adamski Z, Kaszuba A, Dermatologia dla kosmetologów, Wrocław: Elsevier Urban & Partner; 2013.
6. Łuczak M, Łuczak T, Cieścińska C, Czajkowski R. Systemic treatment of alopecia areata. *Dermatology Review/Przegląd Dermatologiczny*. 2013;100(1):53-58.
7. Musiał C, Trychologia kosmetyczna i lekarska, Warszawa: Wydawnictwo Lekarskie PZWL; 2022.
8. Błaszczak-Kostanecka M, Wolska H. Dermatologia w praktyce, Warszawa : Wydawnictwo Lekarskie PZWL; 2017.
9. Kołodziejczak A., Kosmetologia t.2, Warszawa: Wydawnictwo Lekarskie PZWL; 2020.
10. Wernicka A, Wyzgał M, Waśkiel-Burnat A, Sikora M. Androgenetic alopecia as a cardiovascular risk factor. *Dermatology Review*. 2018;105(6):716-725. doi:10.5114/dr.2018.80841.
11. Rycroft RJ, Robertson SJ, Wakelin SH, Dermatologia, Warszawa: Wydawnictwo Lekarskie PZWL; 2014.

12. Padlewska K, Medycyna estetyczna i kosmetologia, Warszawa: Wydawnictwo Lekarskie PZWL; 2014.
13. Żychowska M, Batycka-Baran A, Baran W, Maj J. Severe cicatricial alopecia as a rare cutaneous side effect due to erlotinib – case report. *Dermatology Review*. 2016;103(5):371-375. doi:10.5114/dr.2016.62888.
14. Latusek M, Brzezińska-Wcisło L. Impact of cyclophosphamide and fluconazole on hair cycle in a rodent model – the problem of drug-induced alopecia. *Dermatology Review*. 2013;100(1):16-25.
15. Furmańska J, Zaba R, Rzepa T, Kubaszewski P. Shame and self-esteem in androgenic alopecia patients. *Dermatology Review*. 2021;108(4):314-316. doi:10.5114/dr.2021.110736.
16. Brzezińska-Wcisło L, Rakowska A, Rudnicka L, Bergler-Czop B, Czuwara J, Maj J. Androgenetic alopecia. Diagnostic and therapeutic recommendations of the Polish Dermatological Society. *Dermatology Review*. 2018;105(1):1-18. doi:10.5114/dr.2018.74162.
17. Spano F, Donovan JC. Alopecia areata: Part 2: treatment. *Can Fam Physician*. 2015;61(9):757-61. PMID: 26371098; PMCID: PMC4569105.
18. -of Topical Finasteride in the Treatment of Androgenetic Alopecia in Men and Women. *J Drugs Dermatol*. 2018;17(4):457-463. PMID: 29601622; PMCID: PMC6609098.
19. Avci P, Gupta GK, Clark J, Wikonkal N, Hamblin MR. Low-level laser (light) therapy (LLLT) for treatment of hair loss. *Lasers Surg Med*. 2014;46(2):144-51. doi: 10.1002/lsm.22170. Epub 2013 Aug 23. PMID: 23970445; PMCID: PMC3944668.
20. van Zuuren EJ, Fedorowicz Z, Schoones J. Interventions for female pattern hair loss. *Cochrane Database Syst Rev*. 2016;2016(5):CD007628. doi: 10.1002/14651858.CD007628.pub4. PMID: 27225981; PMCID: PMC6457957.
21. Völker JM, Koch N, Becker M, Klenk A. Caffeine and Its Pharmacological Benefits in the Management of Androgenetic Alopecia: A Review. *Skin Pharmacol Physiol*. 2020;33(3):93-109. doi: 10.1159/000508228. Epub 2020 Jun 29. PMID: 32599587.
22. Guo EL, Katta R. Diet and hair loss: effects of nutrient deficiency and supplement use. *Dermatol Pract Concept*. 2017;7(1):1-10. doi: 10.5826/dpc.0701a01. PMID: 28243487; PMCID: PMC5315033.
23. Clemente Plaza N, Reig García-Galbis M, Martínez-Espinosa RM. Effects of the Usage of L-Cysteine (L-Cys) on Human Health. *Molecules*. 2018;23(3):575. doi: 10.3390/molecules23030575. PMID: 29510494; PMCID: PMC6017824.
24. Abbas AN. Ginger (*Zingiber officinale* (L.) Rosc) improves oxidative stress and trace elements status in patients with alopecia areata. *Niger J Clin Pract*. 2020;23(11):1555-1560. doi: 10.4103/njcp.njcp_59_19. PMID: 33221781.
25. Chyl-Surdacka K, Gerkowicz A, Chodorowska G. The role of vitamin D in alopecia areata. *Dermatology Review*. 2016;103(2):185-188. doi:10.5114/dr.2016.59142.
26. Vañó-Galván S, Camacho F. New Treatments for Hair Loss. *Actas Dermosifiliogr*. 2017;108(3):221-228. English, Spanish. doi: 10.1016/j.ad.2016.11.010. Epub 2017 Jan 3. PMID: 28061966.

Barbara Nieradko-Iwanicka
Zakład Higieny i Epidemiologii
Uniwersytet Medyczny w Lublinie
20-093 Lublin, ul. Chodźki 7
e-mail: barbara.nieradko-iwanicka@umlub.pl

